Northern Cheyenne Tribe

Northern Cheyenne Reservation Spring and Well Water Study Sampling Strategy

Project Overview Summary and Discussion

Natural springs on the reservation that are heavily used by tribal members and the surrounding community for drinking water. The Northern Cheyenne Tribe is requesting technical support to develop a more structured and comprehensive monitoring plan for both natural springs and private well systems. This project will also provide limited funding to carry out the establishment of a spring and well monitoring plan for water contaminants as well as support initial water sampling at natural springs and select private wells. In order to understand these potential risks, Northern Cheyenne Tribe will be:

1) testing of four natural springs (Crazy Head, N. Stebbins, Birney Metal Pipe, and Birney Black Pipe), as well as 20 private wells for a Full Domestic Analysis as identified by the Montana Well Educated Program. The Full Domestic Analysis includes: Alkalinity, Aluminum, Bacteria (coliform + E. coli), Calcium, Chloride, Conductivity, Corrosivity, Fluoride, Hardness, Magnesium, Manganese, Nitrate + Nitrite as N, pH, Potassium, Sodium, Sulfate, Total Dissolved Solids (TDS), and Zinc. In addition to the full domestic analysis the natural springs and private wells will also be tested for Uranium and Arsenic. At the natural springs pH, conductivity, specific conductance, salinity, ORP, TDS, and temperature of the springs will be tested using the Yellow Springs Instrument (YSI) owned and operated by the Northern Cheyenne Department of Environmental Protection and Natural Resources.

2) developing a more structured and comprehensive plan for monitoring these drinking water sources in the long term.

Education and outreach materials will be developed to educate community members on the results of the project and best practices for avoiding contamination.

The benefits of this will be a comprehensive monitoring plan for both springs and private well systems, and the collection of baseline data that will inform future data collection and contaminant prevention efforts. Extensive education and outreach to address negative perceptions around drinking water. Outreach and education will take many forms, including through newsletters, public service announcements, reports, and public notices regarding the safety of all water sources.

Funding has been provided by Centers for Disease Control and Prevention (CDC) with assistance from the National Tribal Water Center (NTWC) to support Northern Cheyenne Tribe with creating and implementing a spring and well water monitoring plan.

Sampling Staff and Procedures

Spring and well water samples will be collected Energy Laboratories of Billings MT guidelines. Sampling will be conducted and transported to the Energy Laboratory by the Northern Cheyenne Tribe Indian Health Service Environmental Health staff stationed at the Lame Deer field office. Samples will be identified by home owner name, and the address will be verified at the time of sampling. Chain of custody forms will be filled out at the time of sampling and then signed when samples are released to the laboratory. A copy of the chain of custody will be returned to Northern Cheyenne Tribe Indian Health Service staff where completed samples will be tracked. All sample bottles, coolers and specific sampling instructions will be provided by the laboratory. Sampling instructions will be kept in a designated file for future reference.

Northern Cheyenne Tribe Indian Health Service staff will receive laboratory reports for reporting and long term tracking. The identifying data (home owner name, and the address) will be coded and removed from the laboratory reports prior to being shared with the NTWC and CDC.

Sampling Timeframe

Samples will be collected once the data management plan is accepted by CDC and according to the sampling schedule. Monthly sampling will be taken at the four natural springs (Crazy Head, N. Stebbins, Birney Metal Pipe, and Birney Black Pipe). Private well samples being will be taken as near to late spring/early summer as possible given staff availability in an attempt to acquire results during the potential contaminant high season.

Sampling Strategy

The sampling of the four natural springs will occur monthly for the Full Domestic Analysis as well as Uranium and Arsenic. The well sampling protocol provided by Energy Laboratories will be followed when collecting spring and well water samples. (Appendix A.)

A Geographic convenience sampling approach will be followed when identifying the private wells to be sampled. There are approximately 230 homes on the reservation. The sampling of the 20 private wells will be broken down into to the two main watersheds of the Northern Cheyenne Reservation. These two watersheds include the Rosebud Creek watershed and the Tongue River watershed (Figure 1).

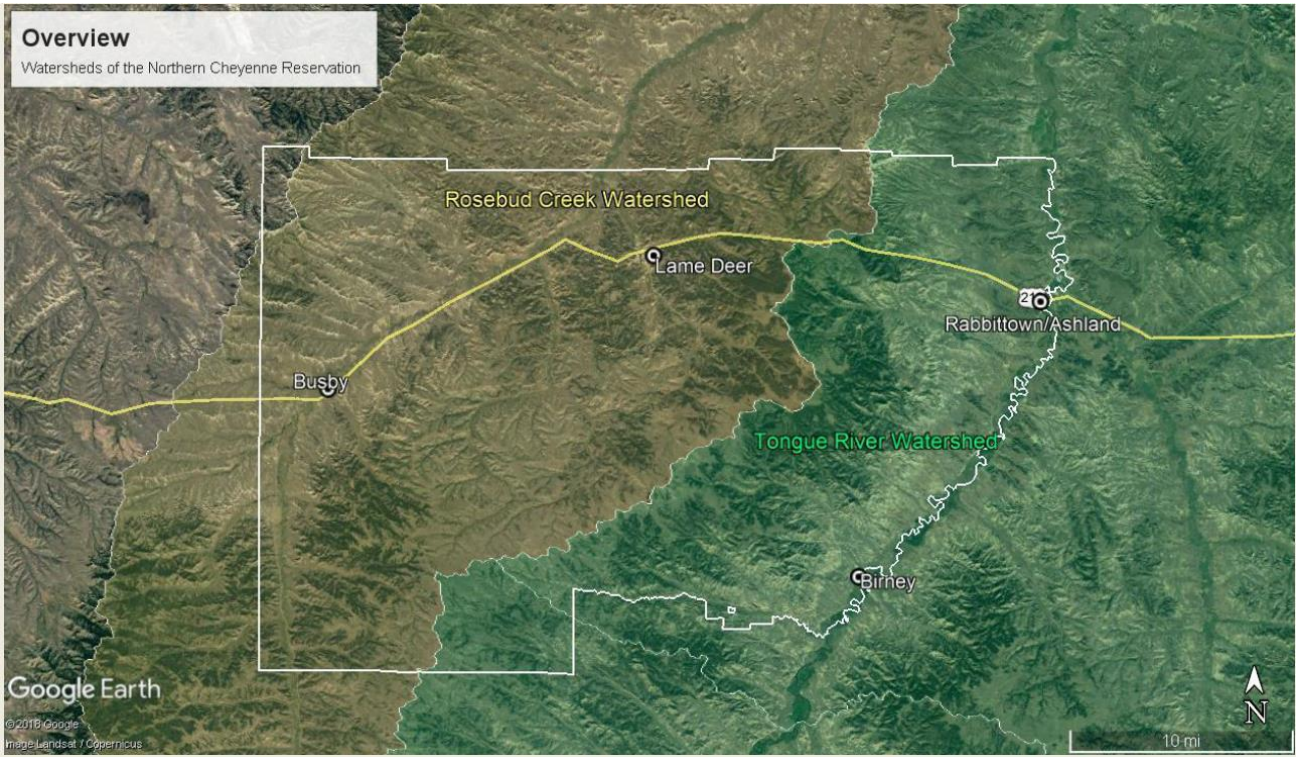

Figure 1. The two main watershed of the Northern Cheyenne Reservation.

Based on the 20 private well sample size, total homesites and well locations on the N. Cheyenne Reservation a proportional distribution will be as follows.

Table 1. Proportional distribution of the N. Cheyenne Private Well Sampling for 20 samples

Location	Home sites (approx. 230 total)	Percentage of Total Homes	Number of samples collected in location
Rosebud Creek (Figure 2)	100	40%	8
Muddy Creek (Figure 2)	40	17%	Between 3 and 4
Lame Deer Creek Upstream from Lame Deer (Figure 3)	20	9%	Between 1 and 2
Lame Deer Creek Downstream from Lame Deer (Figure 4)	20	9%	Between 1 and 2
Tongue River Between Birney and Rabbittown (Figure 5)	10	4%	Between 1 and 2
Tongue River North of Rabbittown (Figure 6)	20	9%	Between 1 and 2, with additional 1-2 samples from the housing cluster
Highway 212 West of Rabbittown (Figure 6)	20	9%	Between 1 and 2, with additional 1-2 samples from the housing cluster

The Busby Area includes the majority of personal wells on the Northern Cheyenne Reservation. This area follows the Rosebud Creek and Muddy Creek. (Figure 2.)

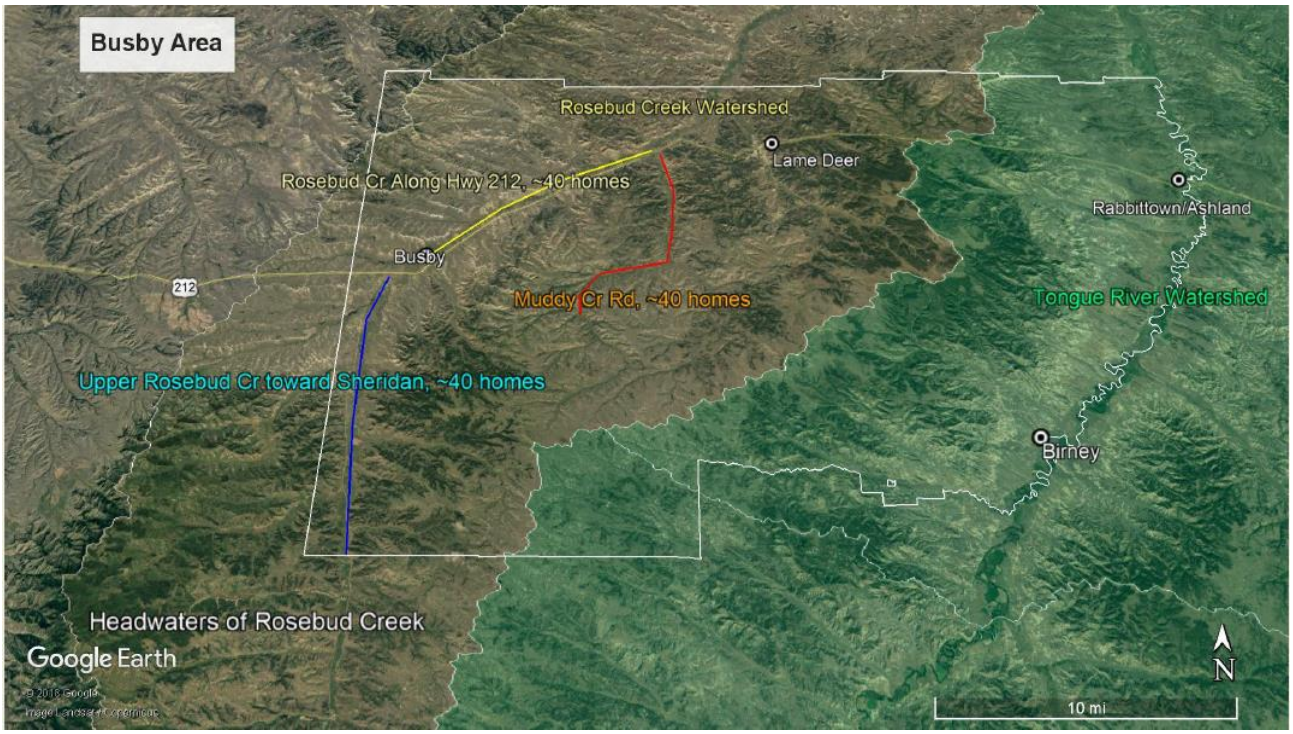

Figure 2. Map of the Northern Cheyeene Reservation identifying areas of homesites along the Rosebud Creek and Muddy Creek located to the West and Southwest of Lame Deer in the Busby Area.

The Lame Deer Area Northwest includes the confluence of Lame Deer Creek and Rosebud Creek. The Highway between Lame Deer and Muddy Cluster includes approximately 20 homesites. (Figure 3.)

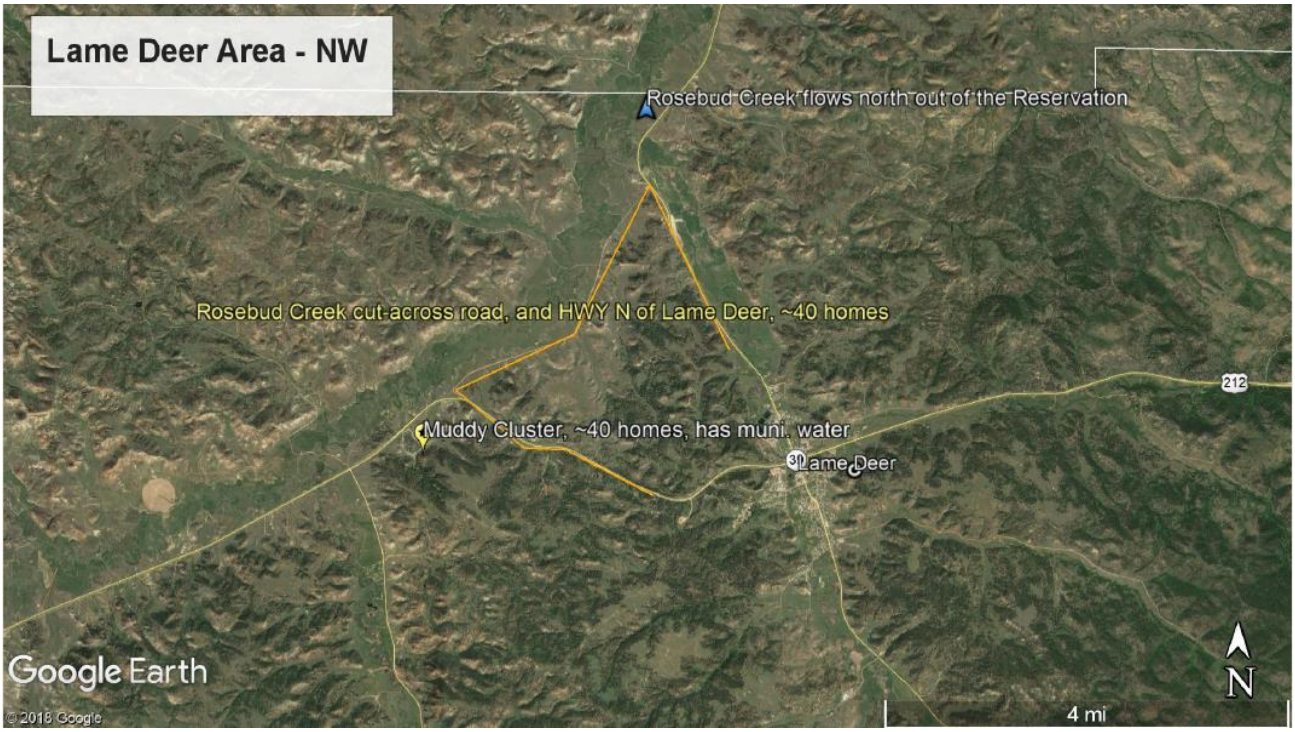

Figure 3. Area Northwest of Lame Deer

The Lame Deer Area Southeast along the upper Lame Deer Creek to Birney includes approximately 20 homesites. (Figure 4.)

Figure 4. Area Southeast of Lame Deer.

The Birney Area between Birney and Rabbittown includes approximately 20 homesites. (Figure 5).

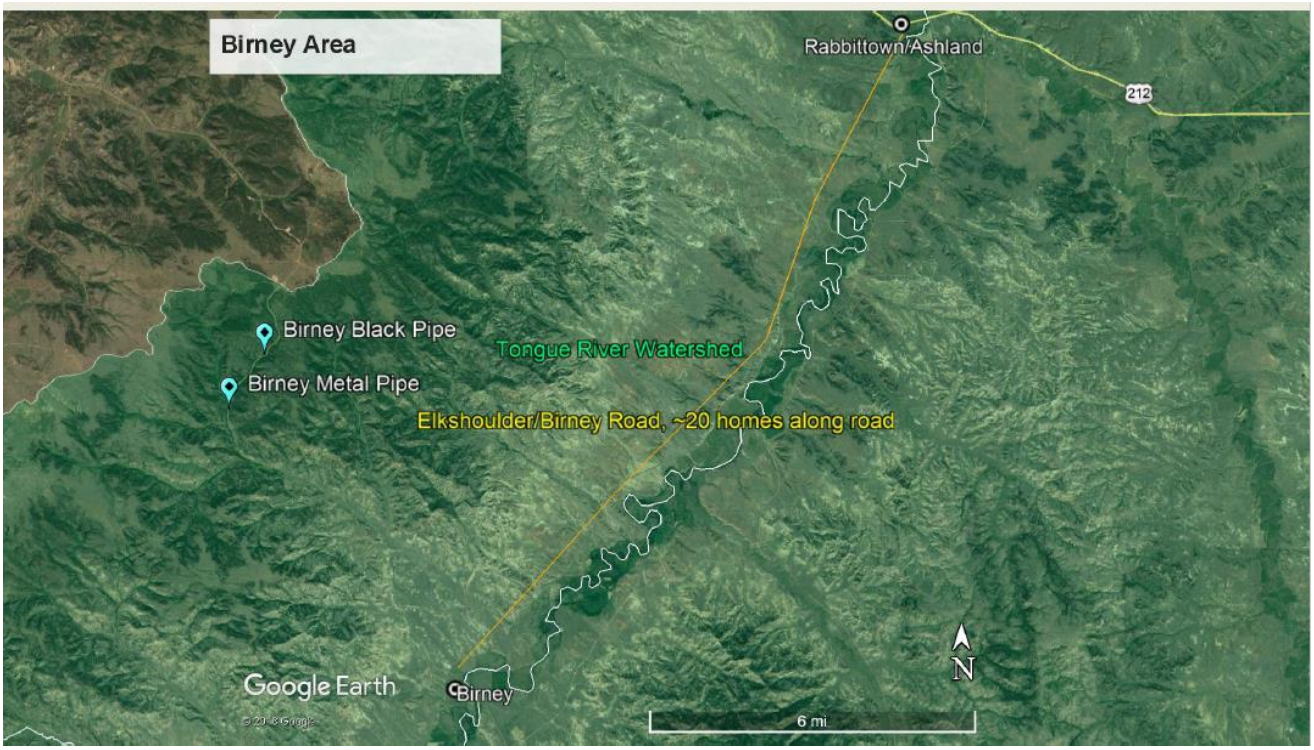

Figure 5. Birney Area between Rabbittown and Birney.

The Ashland area between Rabbittown and the Northeast border of the reservation includes approximately 10 homesites with an additional cluster of homes north of town and another to the west along the highway. Additionally there are approximately five homesites along the stretch of Hwy 212 west of Ashland. (Figure 6).

Figure 6. Ashland Area North of Rabbittown and West of Rabbittown.

The following table offers further detail on the testing strategy and motivation for each contaminant of interest. Note that the total of number of samples for both private wells and natural springs are included.

Contaminant	Sampling Strategy and Motivation	Total Number of Samples	Estimated Cost per Sample	Total Cost of Sampling
Private Well Full Domestic Analysis	The Full Domestic Analysis is a comprehensive inventory of water quality covering critical bacteria and nitrate as well as a broad group of parameters effecting aesthetic and nutritional quality of water (tooth discoloration, taste, smell, staining, corrosive, and scaling properties). The Analysis includes: Alkalinity, Aluminum, Bacteria (coliform + E. coli), Calcium, Chloride, Conductivity, Corrosivity, Fluoride, Hardness, Magnesium, Manganese, Nitrate + Nitrite as N, pH, Potassium, Sodium, Sulfate, Total Dissolved Solids (TDS), and Zinc	**30**	**$80**	**$2400**
Private Well Arsenic Analysis	Arsenic is a naturally occurring contaminant that poses considerable health risks. It has been found in areas surrounding the Northern Cheyenne Reservation and is known to contaminate ground water.	**30**	**$10**	**$300**
Private Well Uranium Analysis	Uranium is a naturally occurring radio active element that poses considerable health risks. It has been found in the areas surrounding the Northern Cheyenne Reservation and is known to contaminate ground water.	**30**	**$10**	**$300**
Natural Springs Full Domestic Analysis	The Full Domestic Analysis is a comprehensive inventory of water quality covering critical bacteria and nitrate as well as a broad group of parameters effecting aesthetic and nutritional quality of water (tooth discoloration, taste, smell, staining, corrosive, and scaling properties). The Analysis includes: Alkalinity, Aluminum, Bacteria (coliform + E. coli), Calcium, Chloride, Conductivity, Corrosivity, Fluoride, Hardness, Magnesium, Manganese, Nitrate + Nitrite as N, pH, Potassium, Sodium, Sulfate, Total Dissolved Solids (TDS), and Zinc	**48**	**$80**	**$3840**
Natural Springs Arsenic Analysis	Arsenic is a naturally occurring contaminant that poses considerable health risks. It has been found in areas surrounding the Northern Cheyenne Reservation and is known to contaminate ground water.	**48**	**$10**	**$480**
Natural Springs Uranium Analysis	Uranium is a naturally occurring radio active element that poses considerable health risks. It has been found in the areas surrounding the Northern Cheyenne Reservation and is known to contaminate ground water.	**48**	**$10**	**$480**
			Total Testing Cost	$ 7800.00

Sampling Matrix
(See Excel File NCT Well & Spring Data Log)

Appendix A.